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ABSTRACT

The primary aim of this study was to ascertain whether expectations affect children's performance on a measure designed to assess development of understanding of the Minimum Distance Principle (MDP) and its exceptions. There were three major hypotheses: (1) sentences harmonious with expectation should be more easily understood than neutral sentences, and contrary sentences should be most difficult to understand, regardless of the verb; (2) there should be fewer misinterpretations of sentences using the verb "to tell" than of those using the verb "to promise," regardless of expectation; and (3) performance should increase with grade level. The test population consisted of 14 males and 14 females from each of the three levels (K-2). It was concluded that there seems to be a point at which expectations have the greatest effect on performance. There were differences between the harmonious and the contrary mean on "tell" sentences in kindergarten and grade one, even though the mean number of correct responses was relatively high. In grade two there was no such difference. (Author)

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EFFECTS OF CHILDREN'S EXPECTATIONS ON MASTERY OF THE MINIMUM DISTANCE PRINCIPLE

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Children's expectations concerning the probable direction of action between the subject and object in a sentence have been found to affect their understanding of passive sentences (Gowie and Powers, 1972). Sentences harmonious with expectation are easier to understand and sentences contrary to expectation are more difficult to understand than are neutral sentences. The primary aim of the present study was to ascertain whether expectations also affect children's performance on a measure designed to assess development of understanding of the Minimum Distance Principle (MDP) and its exceptions.

In most English sentences of the form

(1) NP_1 V NP_2 to inf vb

the second noun phrase, as the noun phrase closer to the complement verb, is its subject. For example, in "He told us to write", it is we who are to write. Constructions using the verb to promise are an exception to this Principle. "He promised us to write" indicates that it is he who will write, i.e., the first noun phrase, which is further from the complement, is the subject of the complement verb to write.

Children's usage of the verbs to ask, which can violate the MDP, to promise, which does violate it, and to tell, which follows the Principle, has been investigated by Carol Chomsky (1969), who hypothesized and found supporting evidence that children assign the wrong subject until they learn the structure associated with certain exceptional verbs. Thus, many children in her sample interpreted sentences with ask and with promise as if they

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meant tell. Chomsky has suggested that children's "errors" may be due to applying the MDP to all sentences of form (1) until they learn the exceptions.

Building on this work, Kramer, Koff, and Luria (1972) tested the competence of children and young adults (ages 3 to 20 years) in using the verbs to ask and to tell. Those subjects who were not competent initially (and who were still available) were reassessed two years later. Improvement was apparent in all age groups, but no group reached total competence. The major difference noted between subjects over age 12 and all younger children was in the most common type of error: younger subjects interpreted ask as tell, whereas the older group assigned the wrong subject to the complement verb in sentences using ask.

In addition to actual competence in using the MDP and its exceptions, children's expectations may be influencing their performance with such sentences. The present study was designed to investigate this relationship. There were three major hypotheses:

(1) Sentences harmonious with expectation should be more easily understood than neutral sentences, and contrary sentences should be most difficult, regardless of the verb;
(2) There should be fewer misinterpretations of sentences using the verb to tell than of those using the verb to promise, regardless of expectation;
(3) Performance should increase with grade level.

Since there was no empirical basis for predicting a direct relationship between type of word association (syntagmatic or paradigmatic) and competence in using the MDP, a question rather than an hypothesis was formulated, namely, would those children who gave more paradigmatic responses on a word association test make fewer misinterpretations on promise sentences?

Word associations were of interest because the syntagmatic-paradigmatic

shift is one indicator of growth in linguistic facility, and because of the possibility of parallel developmental trends. Research has shown that between the ages of 5 and 10 years, children begin to group words --- into syntactic classes (Brown and Berko, 1960), or into clusters presumably related to mediating responses (Entwisle, et al., 1964).[1]

PROCEDURE: The experimental sample for both the construction of materials and the main study consisted of 264 middle-class children in Kindergarten, grade one and grade two attending parochial schools located toward the outskirts of Albany, New York, and both public and parochial schools in three suburban centralized school districts adjacent to that city.

In order to collect data on expectations so that the instrument for the main study could be developed, the verbs promise and tell were presented to 180 children, 60 in each of the three grades in 60 propositions (30 of each verb). The children were asked whether they thought NP_1 or NP_2 was more likely to promise or to tell the other to carry out the action indicated by the complement verb. Each proposition was potentially reversible, and both alternatives were given, with the child choosing the one he or she thought would "usually happen". An individual child evaluated only 10 promise and 10 tell propositions. The order of alternatives within each proposition was reversed for half of the sample.

There were three NP combinations in the propositions: adult-adult,

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[1] Factors influencing responses may be the variety of verbal contexts from which to draw, the number of associates available (Ervin, 1961), socioeconomic status, method of administration (Entwisle and Forsyth, 1963), age (Brown and Berko, 1960), school attendance (Sharp and Cole, 1972), and literacy (Reynolds and Palmatier, 1969).

child-child, and adult-child. Adult-child combinations in the 21 promise sentences included in the final instrument appeared 11 times in Kindergarten, 12 times in grade one, and 11 times in grade 2; in the 21 tell sentences included, adult-child combinations appeared in the identical respective frequencies. With neither verb was the choice of child or of adult as subject dependent on grade, i.e., the number of times each was chosen was not different from grade to grade. (This was determined by 2 χ^2 tests, each with 2 d.f.: for promise, $\chi^2 = 2.983$, for tell, $\chi^2 = .002$.) The proportion of times the child was chosen as subject of tell sentences was significantly less than 0.5 ($p < .001$, binomial test on proportions). The 0.99 confidence interval on the proportion of times the child was chosen as subject ranged from zero to 0.21. Children expected that adults would tell them what to do (31 of 34 sentences) and that they would make promises to adults (18 of 34 sentences).

MAIN STUDY: Subjects for the main study were 14 males and 14 females from each of the three grades. Only those who completed all sections were included in later analyses of the data. Children giving clang responses on the word association test, or those failing to respond to any item on that test, were excluded from the sample. None had to be excluded for failure to respond to the promise and tell items.

EXPERIMENTAL MATERIALS: Twenty-one promise and 21 tell sentences were selected for each grade from the initial pools of 60.* Included in the final instrument were those items which were most clearly neutral, in that nearly equal numbers of children chose NP_1 and NP_2 as the actor, and those items most clearly reflecting an expectation, in that the majority of children preferred one NP over the other as actor. Harmonious sentences reflected the

*30 per verb

preferences of the greatest number of children, and contrary sentences reflected the preferences of fewest children. Those sentences and the number of children choosing the alternative form included in the instrument are listed in Tables I-III. It is apparent from Table I-a that it was impossible

Insert Tables I-III about here

to find 7 promise sentences rarely chosen by Kindergarteners (i.e., contrary items). Expectations of Kindergarteners were less stereotyped than those of the older children and were about evenly divided between NP_1 and NP_2.

Seven promise and 7 tell sentences were harmonious, 7 were neutral, and 7 were contrary to the expectations of children at each grade level. Sentences using promise were arranged randomly with respect to expectation, as were those using tell.

The word association test consisted of 7 verbs, 7 nouns, and 7 adjectives having single grammatical functions, as identified by Carroll (1971). Those were: ask, begin, sit, shut, tell, untie, read; brother, car, day, jungle, siren, sky, river; alive, happy, old, sick, strong, tiny, and wonderful.

Examples of promising and telling were discussed with each child, and two sample items were presented before each sub-test. Children heard 21 statements using the verb to promise and answered a question related to each one, e.g., "Mother promises father to bake a cake. Who will bake the cake?" Then the word association test was administered, followed by 21 items using the verb to tell.

DESIGN: Because sex was a factor in all of the significant interactions in the previous study using expectations (Gowie and Powers, 1972), it, as well as type of word association, was a blocking variable. This yielded a 3 x 2 x

2 x 2 x 3 design (grade by sex by verb by type of word association by expectation) with repeated measures over the dimensions of verb (promise and tell) and expectation (harmonious, neutral, and contrary). The two levels of word association (higher and lower rates of paradigmatic responding) were determined by a median split within each sex and grade; therefore, word association was nested within sex and grade.

RESULTS: The results of the analysis of variance are shown in Table IV.

Insert Table IV about here

Grade was a significant effect ($p < .001$). The Newman-Keuls procedure was applied to investigate differences between the grade means. Second graders answered significantly more questions correctly than did Kindergarteners ($p < .01$) and more than did first graders ($p < .05$). Kindergarten and first grade means were not significantly different.

The verb used in the sentences was also a significant effect. Performance with tell was better than with promise ($p < .001$).

The third significant effect was expectation ($p < .001$): harmonious sentences were easier than contrary sentences ($p < .001$, Newman-Keuls); and harmonious and neutral sentences were of equal difficulty.

Significant interactions were: grade by expectation ($p < .025$), verb by expectation ($p < .001$), and grade by verb by expectation ($p < .001$). These are shown in Figures 1 through 3 respectively. Tukey's procedure was used to test means in all interactions.

Insert Figures 1-3 about here

DISCUSSION: The mean number of correct responses for second graders was 5.56 over all conditions. This level of performance was superior to that achieved by Kindergarteners ($\bar{X} = 4.24$) and first graders ($\bar{X} = 4.74$), whose mean scores were statistically identical. Even with a verb as common as tell, there were more errors in interpretation in the two lower grades.

Hypothesis 3 was, therefore, partially confirmed.

The difficulty experienced with the verb promise relative to tell confirmed hypothesis 2 and added support to C. Chomsky's suggestion (1969) that children learn a general pattern of the language before learning an exceptional structure associated with a particular verb.

Many children had not learned how to use the structure associated with the verb to promise, although they understood the verb's meaning. For example, a child might say that "Father will promise mother to bake a cake" reflects a more common state of affairs than does "Mother will promise father to bake a cake" and yet indicate that it is mother who will do the baking. That is, his expectation favors one outcome, based on a semantic system, yet his syntactic immaturity does not allow him to express that expectation in a form appreciated by an adult speaker.

Sentences contrary to expectation elicited more misinterpretations than did harmonious and neutral sentences. The latter two levels of expectation were not significantly different, possibly indicating that expectation is an individual difference. Sentences were classified according to the expectations of the majority of children interviewed. Most children said, for example, that father rather than mother would paint the fence, and, therefore, a sentence reflecting that expectation would have been classified as harmonious. The rare child who honestly believed that mothers paint fences more often was actually encountering a contrary, not a harmonious sentence when hearing that item. Therefore, measurement of the effects of expectations was confounded for that child.

The grade by expectation interaction is shown in Figure 1. The mean scores in the neutral and contrary conditions in Kindergarten (4.05 and 4.09) are statistically equal. However, all other means are significantly different

from each other. In Kindergarten harmonious sentences were easiest, but in the other two grades the pattern changed so that neutral sentences were easiest, harmonious items were of middle difficulty, and contrary items were most difficult.

The equality of Kindergarten means in the neutral and contrary conditions may be related to the difficulty in classifying promise sentences with regard to expectation (cf. Table I-a). However, this difficulty was not encountered in the two other grades, and it does not provide hints as to the reasons for neutral sentences' being easier than harmonious in the upper grades.

Analysis of the verb by expectation interaction (cf. Figure 2) disclosed that the following means were equal: promise-contrary and promise-neutral; tell-contrary and tell-neutral; and promise-harmonious and promise-contrary. All other means were significantly different. The greatest difference between verbs was in the harmonious condition, followed by neutral and contrary. It is curious that the predicted order of difficulty was essentially supported by the data from the tell sentences, i.e., those in accordance with the general pattern in the language, but that the order was disrupted by the exceptional verb to promise.

Possibly worthy of mention is the similarity between the graph of this interaction and the verb by expectation interaction in grade one (Fig. 3). The same pattern is apparent in both, and the same means are significantly different---to this extent the graphs are identical. Kindergarten and grade two seem to "balance" each other so that the grade one pattern is the same as the overall pattern. This implies an extremely orderly progression in the development of facility with promise and tell.

Figure 3 depicts the grade by verb by expectation interaction. The three means from promise sentences were not different in Kindergarten (Harmonious=2.46, Neutral=2.71, Contrary=3.18). (The critical range for means to be significantly different was 0.967.) The expected mean number of correct responses on seven items with two alternatives, if selection of each alternative were on a purely random basis, is 3.5. The Kindergarten promise means were all below this chance level. The implication is that Kindergarteners are not "making mistakes", but are following a rule different from the adult practice. Because of the format of the instrument, it is impossible to know whether they assigned the wrong subject to the complement verb or interpreted promise as tell. In either case, their responses were systematically different from the adult norm.

Kindergarteners' performance with tell was affected by expectation as predicted: harmonious sentences were easier than neutral and contrary items (H=6.68, N=5.39, C=5.00). First graders also scored significantly higher on tell sentences harmonious with expectation (6.71) than on contrary sentences (5.50). Performance was facilitated when sentences were in accordance with children's expectations and was hindered when they were discordant.

With promise the highest level of achievement in first grade was found in the neutral condition (3.89). This was different from the mean score in the harmonious condition (2.86) but not in the contrary condition (3.39). None of these is different from the chance level (3.5).

In grade two, performance with promise was the same across levels of expectation (H=4.21, N=4.43, C=4.21), as was performance with tell (H=6.89, N=6.93, C=6.68). Since the mean score on tell sentences is near the maximum possible, it seems that expectation introduces little, if any, confusion once mastery has been achieved. Although the second grade promise means across

levels of expectation are statistically the same, those means ($\bar{X}$=4.28) are nowhere near the maximum.

In none of the three grades was there overlap between the promise means and the tell means. Kindergarteners' performance with tell and second graders' performance with promise did overlap, however, at two points: 1) all second grade means on promise items and the Kindergarten mean on contrary tell items fell within the same critical range, and 2) the second grade mean on neutral promise items was not different from the Kindergarten mean on neutral and contrary tell items.

CONCLUSION: There seems to be a point at which expectations have the greatest effect on performance. There were differences between the harmonious and the contrary means on tell sentences in Kindergarten and grade one, even though the mean number of correct responses was relatively high. In grade two there was no such difference.

It would seem that expectation is not yet helping or hindering usage of the verb to promise in this age group: means in Kindergarten as well as in grade two were equal, and in grade one harmonious and contrary, and neutral and contrary means were equal. The *F* value in the grade by verb interaction was less than one, also indicating that promise was equally problematic for all three age groups; performance with this verb did not differ greatly from grade to grade. One suspects that if older children were included in the experimental sample, one would find a stage in which the predicted order of difficulty (H< N< C) was supported by the data. This should appear before the level of mastery is reached.

It should also be noted that Carol Chomsky's methodology involved having children manipulate objects; Kramer, Koff, and Luria successfully

used a directed dialogue, but had to discard data based on subjects' matching of pictures and sentences. The procedure used in the present study was entirely verbal, yet the general results are similar to those of the previous two investigations. It would be interesting to compare an individual child's responses to tasks using the verb to promise which were presented in different modes.

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Fig. 1. GRADE BY EXPECTATION INTERACTION

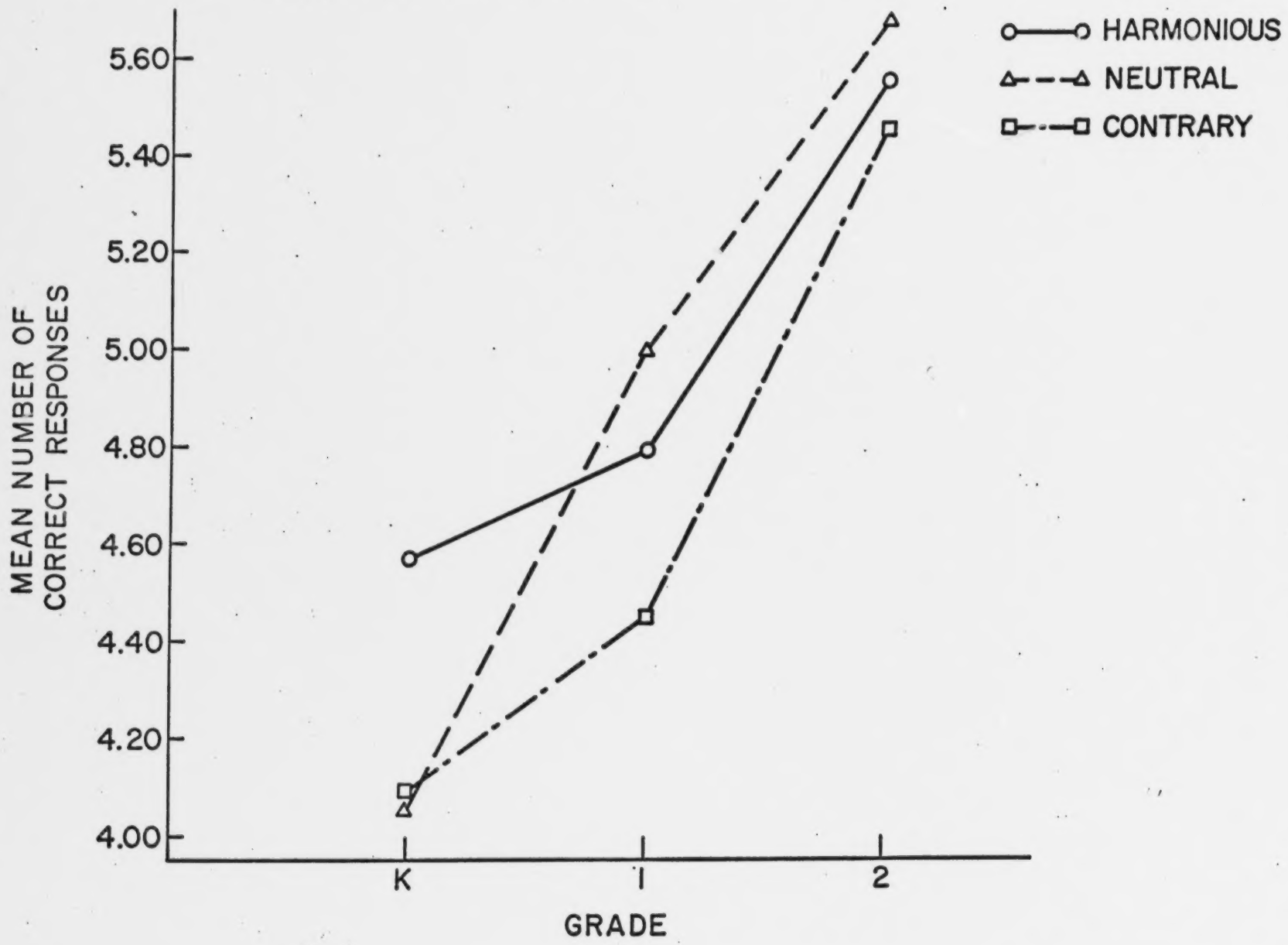

FIG. 2. VERB BY EXPECTATION INTERACTION

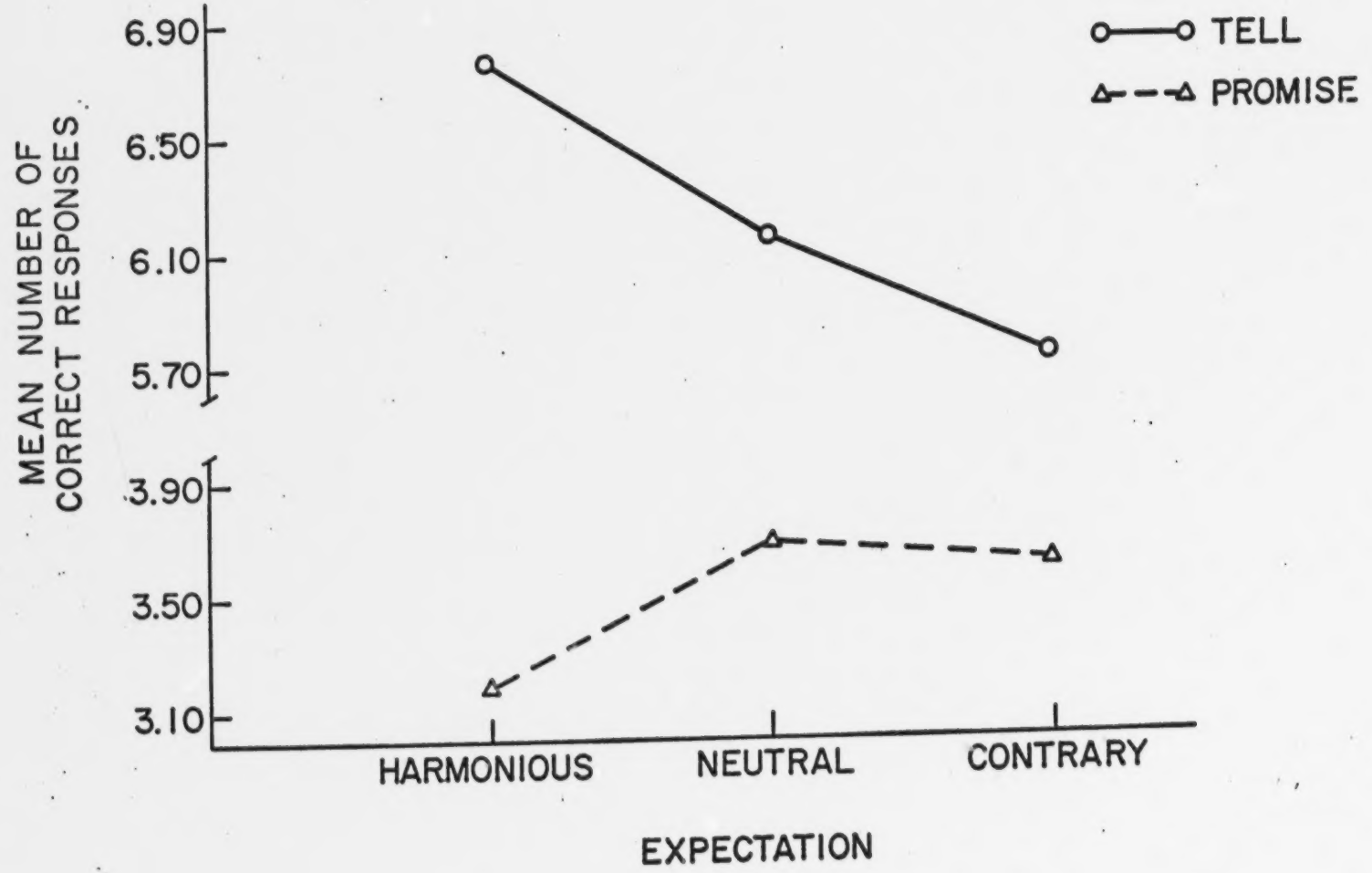

Fig. 3. GRADE BY VERB BY EXPECTATION INTERACTION

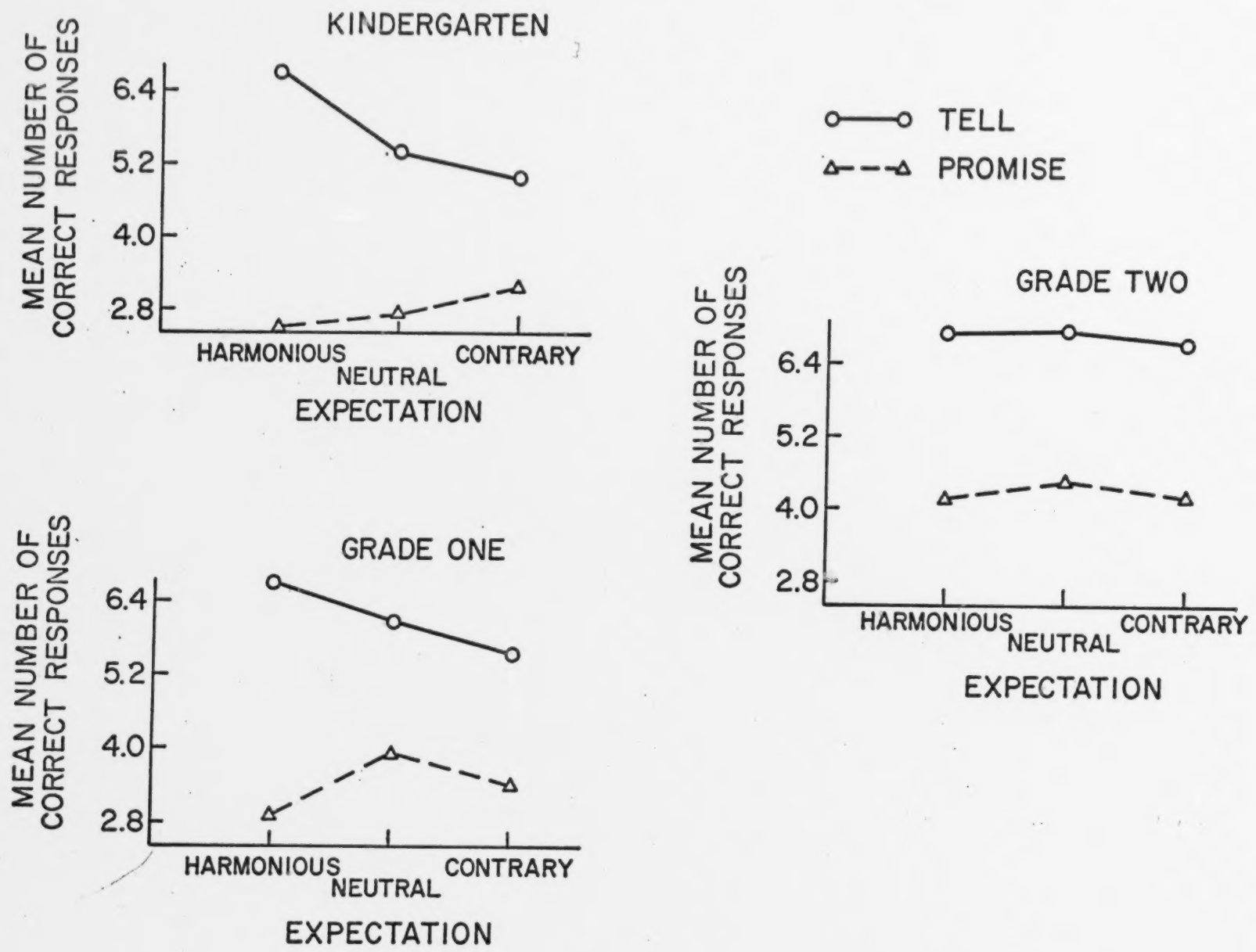

Table I-a

Promise sentences used on criterion measure and number of Kindergarteners selecting first noun as subject*

Harmonious

13	Father promises Mark to go to the firehouse.
13	Bill promises Tom to eat lunch now.
12	The teacher promises John to use a crayon.
15	Mother promises father to wash the shirt.
13	The teacher promises John to go to the blackboard.
13	Father promises mother to wash the dog.
12	Bill promises Tom to play softball.

Neutral

10	Mother promises Barbara to make the bed.
10	Mark promises father to close the door.
10	Tom promises Bill to come right back.
10	Mother promises Barbara to stand up.
9	Barbara promises mother to come home early.
9	Bill promises Tom to color the picture.
10	John promises the teacher to sit on the chair.

Contrary

8	Father promises mother to polish the shoes.
9	Barbara promises mother to drink the milk.
9	Sue promises Nancy to push the swing.
7	Father promises Mark to clean the fish tank.
9	Mark promises father to set the table.
8	Father promises mother to take out the garbage.
6	Father promises mother to bake a cake.

* Maximum possible = 20.

Table I-b

Tell sentences used on criterion measure and number of Kindergarteners selecting first nouns as subject*

Harmonious

15	The teacher tells John to answer the question.
13	Father tells Mark to go outside.
14	Father tells mother to wash the floor.
14	Father tells Mark to water the garden.
14	Mother tells Barbara to listen carefully.
16	The teacher tells John to put on a coat.
16	Mother tells father to fix the chair

Neutral

10	Bill tells Tom to send the letter.
10	The teacher tells John to put away the papers.
9	Tom tells Bill to brush the dog.
11	Sue tells Nancy to hang up the picture.
9	Barbara tells mother to dry the dishes.
10	John tells the teacher to read a story.
10	Mother tells Barbara to look at the picture.

Contrary

6	Father tells mother to mow the lawn.
5	John tells the teacher to talk louder.
8	Nancy tells Sue to play on the teeter-totter.
7	Tom tells Bill to play marbles.
7	Father tells mother to paint the fence.
8	Mark tells father to play a game.
7	Tom tells Bill to stand on the book.

* Maximum possible = 20.

Table II-a

Promise sentences used on criterion measure and number of first graders selecting first noun as subject*

Harmonious

14	Father promises Mark to clean the fish tank.
14	Father promises Mark to go to the firehouse.
17	The teacher promises John to take attendance.
13	Mother promises Barbara to come home early.
13	Mother promises Barbara to sharpen the pencil.
16	Mother promises father to wash the shirt.
13	Tom promises Bill to play softball.

Neutral

10	Barbara promises mother to stand up.
10	John promises the teacher to sit on the chair.
11	Mother promises father to polish the shoes.
10	Mother promises father to bake a cake.
11	Nancy promises Sue to watch Sesame Street.
10	John promises the teacher to open the window.
11	Mark promises father to wash the dog.

Contrary

7	Mother promises father to wash the dog.
6	Bill promises Tom to come right back.
7	Sue promises Nancy to bring in the book.
8	Mother promises Barbara to make the bed.
8	John promises the teacher to use a crayon.
8	Father promises Mark to close the door.
7	Bill promises Tom to color the picture.

* Maximum possible = 20.

Table II-b

Tell sentences used on criterion measure and number of first graders selecting first noun as subject*

Harmonious

20	The teacher tells John to answer the question.
17	The teacher tells John to put away the papers.
14	Father tells mother to wash the floor.
17	Mother tells father to mow the lawn.
16	Father tells Mark to go outside.
17	Mother tells Barbara to listen carefully.
15	Mother tells Barbara to dry the dishes.

Neutral

10	Sue tells Nancy to stop talking.
11	Nancy tells Sue to play on the teeter-totter.
10	Tom tells Bill to climb the tree.
11	Bill tells Tom to brush the dog.
9	Mark tells father to play a game.
9	Bill tells Tom to stand on the box.
10	Mother tells Barbara to look at the picture.

Contrary

3	Barbara tells mother to pick up her room.
3	Mark tells father to eat the cookies.
5	Mark tells father to water the garden.
6	John tells the teacher to talk louder.
4	Mark tells father to ride the bike.
3	Father tells mother to paint the fence.
2	John tells the teacher to put on a coat.

* Maximum possible = 20.

Table III-a

Promise sentences used on criterion measure and number of second graders selecting first noun as subject*

Harmonious

15	Father promises Mark to go to the firehouse.
15	Barbara promises mother to sharpen the pencil.
16	Barbara promises mother to come home early.
12	Mark promises father to set the table.
14	Barbara promises mother to make the bed.
14	John promises the teacher to use a crayon.
15	The teacher promises John to go to the blackboard.

Neutral

11	Mother promises father to polish the shoes.
9	John promises the teacher to take attendance.
10	Nancy promises Sue to look at the bird.
9	Tom promises Bill to color the picture.
10	Tom promises Bill to come right back.
9	Mother promises Barbara to stand up.
11	Mother promises father to wash the dog.

Contrary

7	Tom promises Bill to play softball.
4	Father promises Mark to wash the dog.
5	Father promises mother to wash the shirt.
8	Tom promises Bill to shoot the water pistol.
5	Mother promises father to take out the garbage.
7	Father promises Mark to close the door.
7	Father promises mother to bake a cake.

* Maximum possible = 20.

Table III-b

Tell sentences used on criterion measure and number of second graders selecting first noun as subject*

Harmonious

18	Mother tells father to mow the lawn.
18	Mother tells Barbara to listen carefully.
18	Father tells Mark to water the garden.
20	The teacher tells John to put away the papers.
19	Mother tells father to fix the chair.
19	Mother tells father to paint the fence.
19	Father tells Mark to ride the bike.

Neutral

9	Sue tells Nancy to stop talking.
9	Tom tells Bill to brush the dog.
11	Sue tells Nancy to play on the teeter-totter.
9	Tom tells Bill to play marbles.
10	Tom tells Bill to climb the tree.
9	Nancy tells Sue to feed the fish.
11	Mother tells Barbara to look at the picture.

Contrary

1	John tells the teacher to answer the question.
0	Mark tell father to go outside.
1	Barbara tells mother to dry the dishes.
2	Mother tells father to wash the floor.
2	Mark tells father to eat the cookies.
0	John tells the teacher to put on a coat.
0	Barbara tells mother to pick up her room.

* Maximum possible = 20.

Table IV

Analysis of Variance

Grade X Sex X Word Association X Verb X Expectation

Source	df	Mean Square	F
Grades (G)	2	74.681	8.544***
Sex (S)	1	.002	<1
Word Association (W) within G and S	6	11.216	1.283
G X S	2	4.181	<1
Error 1	72	8.741	
Verb (V)	1	936.447	116.372***
G X V	2	1.339	<1
S X V	1	.446	<1
G X S X V	2	3.934	<1
W X V within G and S	6	14.891	1.851
Error 2	72	8.741	
Expectation (E)	2	4.532	4.868***
G X E	4	2.636	2.831**
S X E	2	.484	<1
G X S X E	4	.297	<1
W X E within G and S	12	.794	<1
Error 3	144	.931	
V X E	2	24.309	23.374***
S X V X E	2	.286	<1
G X V X E	4	4.962	4.771***
G X S X V X E	4	.194	<1
W X V X E within G and S	12	1.480	1.423*
Error 4	144	1.040	
Total	503		

*p < .10
**p < .025
***p < .001